

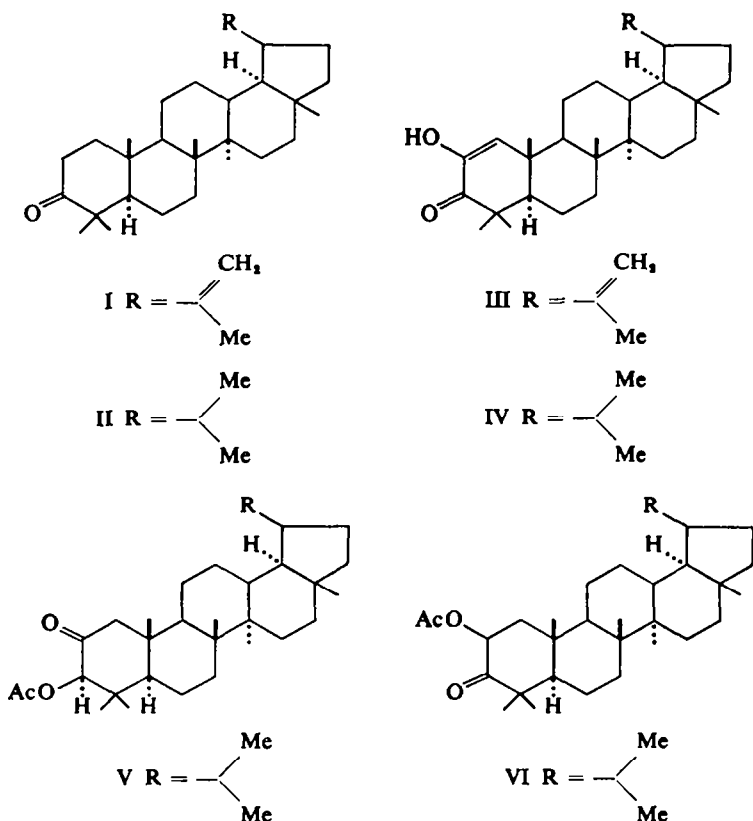
OXIDATION OF RING A IN LUPEOL*†

A. K. GANGULY, T. R. GOVINDACHARI and P. A. MOHAMED
CIBA Research Centre, Goregaon, Bombay 62

(Received 23 May 1966)

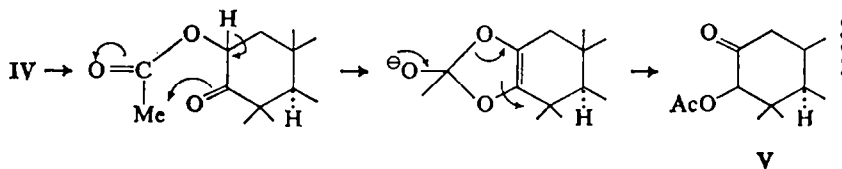
Abstract—Lupeone and lupanone on autoxidation yielded the corresponding diosphenols in almost quantitative yield. Hydrogenation of lupanone diosphenol yielded a dihydro derivative which on acetylation yielded 3 β -acetoxy lupan-2-one.

IN OUR attempts to modify the structures of naturally occurring triterpenoids for inducing biological activity, we have studied oxidation in ring A in lupeol. Lupeone (I) and lupanone (II) in dry t-butyl alcohol containing potassium t-butoxide were rapidly autoxidized to the corresponding diosphenols (III and IV). When hydrogenated, the diosphenol (IV) yielded a non-crystalline keto alcohol which afforded a crystalline keto acetate. Based on the following observations the keto acetate has been assigned structure V. It gave a positive Zimmermann test ($-\text{COCH}_2-$) and in the NMR spectrum it had a sharp singlet at δ 4.95 ascribed to the C_3 -proton. The alternative structure VI for the keto acetate would have a triplet or a quartet for the C_2 -proton. Formation of V from IV could be explained as follows (see arrows):



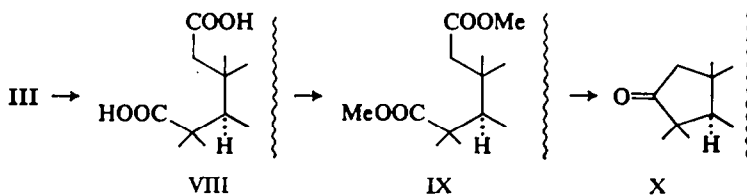
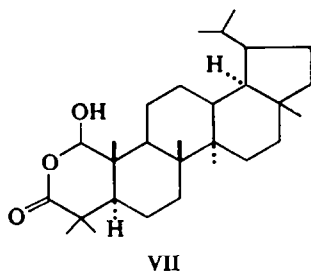
* Contribution No. 54 from CIBA Research Centre.

† Presented at the Symposium on Terpene Chemistry, Poona, June 1965.



Diosphenol (IV) on ozonization gives a neutral compound $C_{29}H_{48}O_3$ which has no selective absorption in UV. Based on its mode of formation, spectral characteristics and elemental composition, it has been assigned structure VII.

In another series of reactions diosphenol (III) was cleaved by alkaline hydrogen peroxide to the dicarboxylic acid (VIII), $C_{30}H_{48}O_4$ which on methylation yielded a dimethyl ester (IX). On refluxing with alcoholic alkali IX yielded a neutral crystalline compound $C_{29}H_{46}O$ (X).



EXPERIMENTAL

M.p.s were determined on a Kofler block. NMR spectrum was determined in $CDCl_3$ at 60 Mc.

Autoxidation of lupeone. Lupeone (1 g) suspended in *t*-BuOH-1N *t*-BuOK (80 ml) was shaken with O_2 for 2 hr (uptake of 1 mol O_2). Water (80 ml) was added and then 6N HCl till the soln was acidic. It was extracted with $CHCl_3$ and the combined extract was washed with water, dried (Na_2SO_4) and distilled to yield a colourless solid which crystallized from acetone-MeOH as colourless needles (0.9 g), m.p. 187–190°, λ_{max} 272 m μ , ν_{max} 3440, 1660, 1640 cm^{-1} , $[\alpha]_D +70.9^\circ$. (Found: C, 81.86; H, 10.58. $C_{30}H_{48}O_3$ requires C, 82.13; H, 10.57%.) It gives positive $FeCl_3$ colour reaction.

Similarly, II (0.9 g) yielded IV (0.85 g) m.p. 210–213°, λ_{max} 272 m μ , ν_{max} 3440, 1660, 1640 cm^{-1} $[\alpha]_D +24.75^\circ$. (Found: C, 82.19; H, 11.27. $C_{30}H_{48}O_3$ requires C, 81.76; H, 10.98%.)

Keto acetate V. Diosphenol IV when hydrogenated (Pd-C) in benzene, yielded a dihydro derivative which was directly acetylated using Ac_2O and pyridine at room temp. The keto acetate (V) crystallized from acetone as cubes, m.p. 295–298°, ν_{max} 1700, 1725 cm^{-1} . (Found: C, 79.50; H, 10.73. $C_{29}H_{46}O_3$ requires C, 79.28; H, 10.81%.)

Ozonolysis of dihydrosdiosphenol. $CHCl_3$ soln of dihydrosdiosphenol (0.75 g) was ozonized at 0° till completion. Crude ozonide was heated on a water bath for 3 hr with $NaHCO_3$ aq and 30% H_2O_2 . It was extracted with $CHCl_3$. The bicarbonate solution on acidification did not yield anything.

The $CHCl_3$ extract was washed with water, dried (Na_2SO_4) and distilled to yield a solid which was crystallized from MeOH, m.p. 205–209°, ν_{max} 3600, 1730 cm^{-1} . (Found: C, 78.32; H, 11.06. $C_{29}H_{46}O_3$ requires C, 78.32; H, 10.88%.)

Alkaline H_2O_2 oxidation. A soln of III (1.36 g) in 2.5% methanolic KOH (200 ml) was treated with H_2O_2 (30%; 15 ml). After refluxing on a water bath for $1\frac{1}{2}$ hr, the MeOH was removed under vacuum, water was added and the soln filtered. The clear filtrate was acidified and extracted with ether. The combined ether extracts were washed with water, dried (Na_2SO_4) and distilled to yield a solid (1.25 g) which was crystallized from ether-hexane, m.p. 165–170°, $[\alpha]_D +49.56^\circ$. (Found: C, 75.73; H, 10.21. $C_{30}H_{48}O_4$ requires C, 76.22; H, 10.24%.)

Conversion of the acid VIII to the ketone X. Compound VIII (1.2 g) yielded a methyl ester with diazomethane which on refluxing with 10% methanolic KOH (30 ml) for 15 hr yielded X (1.16 g), m.p. 194–196°, ν_{max} 1740 cm^{-1} . (Found: C, 84.79; H, 11.21. $C_{30}H_{48}O$ requires C, 84.81; H, 11.29%.)

Acknowledgements—Our thanks are due to Dr. S. Selvinyakam and his staff for microanalyses, IR, UV and NMR spectra.